Small Business Innovation Research/Small Business Tech Transfer

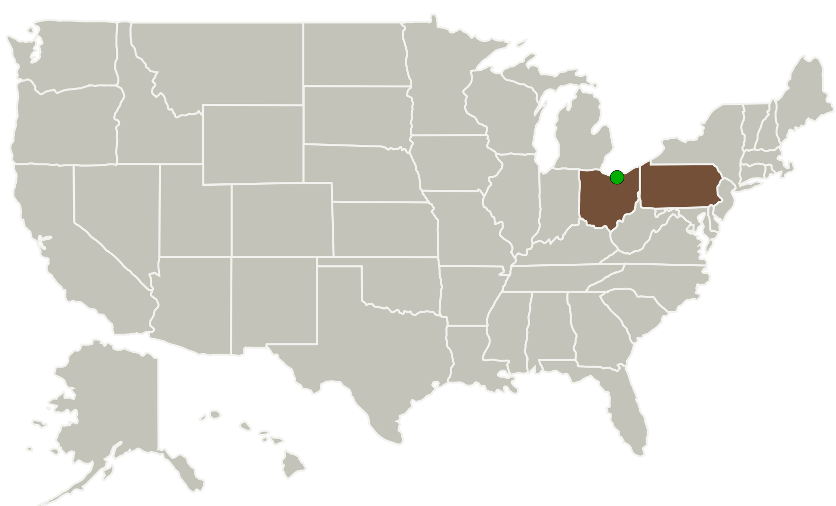
A Software Toolkit to Accelerate Emission Predictions for Turboelectric/Hybrid Electric Aircraft Propulsion, Phase I

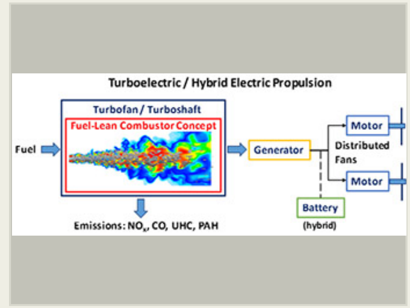
Completed Technology Project (2017 - 2017)

Project Introduction

Electric propulsion represents an attractive path for reducing overall emissions. For larger commercial aircrafts operating in the mega-watt range, power turboelectric and hybrid electric aircraft propulsion will continue to rely on gas turbine engines/generators to provide part of the thrust, charging batteries and driving generators. As a result, reduction of emissions such as oxides of nitrogen (NOx) remains a key concern. The innovation proposed is a software toolkit supporting high-fidelity yet computationally-tractable predictions of NOx emissions and other pollutants in gas-turbine engines/generators within the context of unsteady Computational Fluid Dynamics (CFD) simulations. A well-known difficulty limiting the accurate prediction of NOx levels in turbulent flames is related to the fact that NOx production can evolve through several different chemical pathways characterized by drastically different time scales. In this regard, the overall objective of the proposed SBIR program is to develop and implement an accurate modeling extension to CRAFT Tech?s parameterized LEM-CF turbulent combustion modeling framework to address pollutant formation such as NOx in a computationally-tractable manner and by capturing the relevant characteristic chemical time scales. The Phase I effort is intended to build the foundation of the proposed software toolkit by addressing the feasibility of the key attributes of predictive accuracy, computational efficiency, software portability and general applicability.

Primary U.S. Work Locations and Key Partners





A Software Toolkit to Accelerate Emission Predictions for Turboelectric/Hybrid Electric Aircraft Propulsion, Phase I Briefing Chart Image

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Organizations Performing Work	Role	Type	Location
CRAFT Tech - Combustion Research and Flow Technology	Lead Organization	Industry	Pipersville, Pennsylvania
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Pennsylvania

Project Transitions

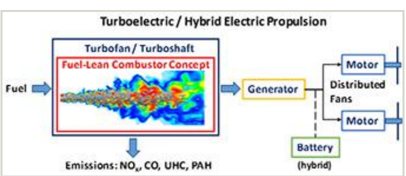
June 2017: Project Start

December 2017: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140750)*

Images



Briefing Chart Image
A Software Toolkit to Accelerate Emission Predictions for Turboelectric/Hybrid Electric Aircraft Propulsion, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/129378)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
CRAFT Tech - Combustion Research and Flow Technology

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

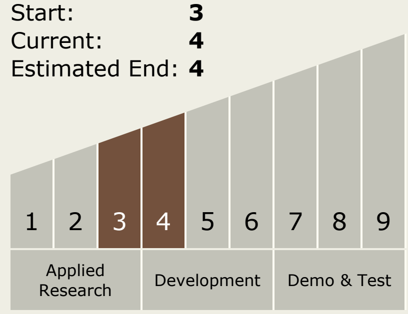
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Andrea Zambon

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX01 Propulsion Systems
  └ TX01.3 Aero Propulsion
    └ TX01.3.9 Hybrid Electric Systems